



BEST PRACTICES

ON BEVERAGE CARTON RECYCLING

■ About this Document

Collection, sorting and effective recycling of used beverage cartons has been established in EU Member States for many years. This document is intended to raise awareness of the recyclability credentials of beverage cartons, whilst highlighting what stakeholders in the value chain can do to facilitate further collection and recycling successes in the future.

This document is a first step in the industry's effort to identify best practices relating to beverage carton collection and recycling. The industry will now to develop a Design for Recycling Guideline which is expected to be delivered early 2021. It will provide more detailed technical criteria to ensure the recyclability of beverage cartons.

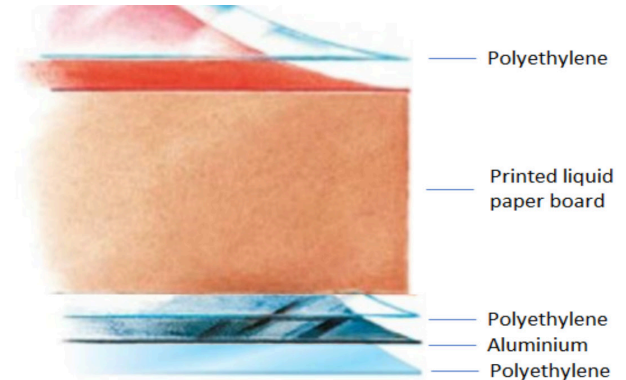
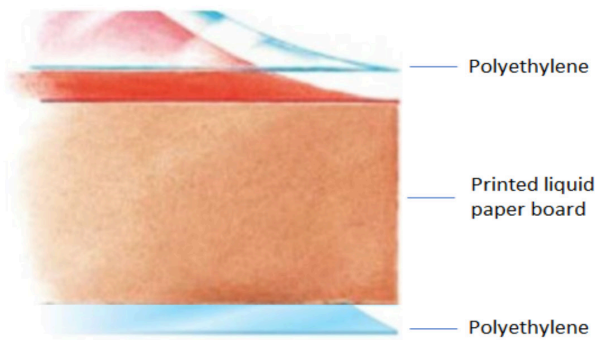
■ Beverage cartons – functional, lightweight, renewable, low carbon and recyclable

The multilayer construction of beverage cartons provides a resource efficient, lightweight, low carbon, and recyclable packaging solution. Sustainably sourced virgin fibres provide strength whilst the other layers provide barriers to water vapour, oxygen and light to protect the contents. The correct combination of materials ensures food safety, whilst preventing food waste by protecting the contents from deterioration. These barrier layers may consist of polymers or a combination of polymers and aluminium, depending on whether the product is kept refrigerated or if it is distributed and stored at room temperature. Whatever the product, only the necessary quantities of each material are used in order to achieve food safety and package functionality.

To maximise recyclability of beverage cartons it is important that collection and sorting at a national level is organized appropriately. Separate collection will deliver the best quality stream of material for reprocessors, which is why ACE strongly supports separate collection of beverage cartons in its communications with policy makers. Several different strategies have been shown to work depending on the local situation. Typically, cartons are collected with light-weight packaging or other paper-based packaging and separated in sorting centres before being sent to papermills with dedicated equipment for recycling of fibres. In some cases, beverage cartons collected with other paper-based packaging may be sent directly to recyclers without further sorting.

Member States report average recycling rates for beverage cartons of 49%¹. The virgin fibres are highly desirable for recycling into new paper-based products and recycling of the fibre fraction is already in place and at scale in Europe. The non-fibre materials are, after recovery of the fibres, handled

as a separate material stream, referred to as PolyAl (consisting mainly of polyethylene and including the small amount of aluminium and any other polymers used within the construction, including caps, lids and straws). A variety of different processes exist for the recycling of the PolyAl fraction.



Design and manufacturing

Recyclability advantages of beverage cartons

The existing and well-functioning collection and recycling regimes already achieving high recycling rates in many countries are testament to the fact that materials used in beverage cartons are recyclable.

Actions to facilitate further recycling successes in the future

Ensure that boards and constructions are repulpable and that fibre and non-fibre materials are easily separable:

The high quality of the virgin fibres used in carton board is the main incentive for mills recycling beverage cartons. Generally, board materials and beverage carton constructions should be tested for repulpability. The implications for minor constituents in the carton construction should also be ascertained (e.g. tie layers, adhesives and inks). This includes

testing of new and alternative barrier solutions used within beverage carton constructions to ensure that they are compatible with the repulping process (i.e. achieving separation of fibres in a reasonable time under specified conditions and with a high fibre yield) and with the recycling processes for PolyAl.

Any new development in the composition of beverage cartons and their components could require adjustments to and/or additional investment in recycling technology. It is important to be aware that the introduction of new constituents, even in small quantities in the overall beverage carton mix, can introduce unexpected challenges for recyclers. Continued innovation is important for delivering more functionality and enhanced sustainability.

Beverage carton designers and manufacturers should build collaborative relationships with recyclers which allow them to jointly explore the recyclability implications and/or determine how



any recycling challenges can be managed when these innovations are brought to market. Testing can be done at lab scale by board and substrate manufacturers and confirmed at operational scale by suppliers of the dedicated repulping equipment or by papermills who have dedicated processes to recycle beverage cartons. Identifying relevant test methods that can be applied by all stakeholders to ensure consistent and comparable results will provide an important foundation for determining and demonstrating the repulpability of carton board and carton constructions.

Do not use materials for barrier layers and other components of the beverage carton that are not compatible with the relevant recycling processes:

Some of the processes for recycling the PolyAl fraction of the substrate require that the polymers used are compatible with each other during end of life recycling and can, for instance, be melted at similar temperatures and thermoformed together into new products. Beverage carton designers and manufacturers should work collaboratively with reprocessors to ensure that any challenges presented by new materials used in carton construction and designs for barrier layers and other components can be managed within the frame of the existing recycling processes within the relevant markets, so that they do not negatively impact on the performance of the subsequent materials and products manufactured from them.

This principle applies to all components, including barrier layers, caps closures, straws and inks. For example:

- ✦ From 2024 closures for beverage cartons in the European market should be designed so that they remain attached to the beverage carton after opening and disposal. This will ensure that these components will be captured within the PolyAl material stream, providing an increased volume of material to be handled.
- ✦ From 2021, plastic straws may no longer be placed on the market within the European Union. Repulpability of paper straws should be confirmed

in order to be recycled in the paper fraction. New materials could also be used but the recyclability implications and solutions to any potential challenges should be investigated collaboratively with reprocessors. For biodegradable and compostable materials, solutions could include easy separation from the PolyAl stream and diversion to other recovery processes such as composting, in line with local best practice and regulatory requirements.

- ✦ For some PolyAl recycling processes, UV inks present a particular challenge. Beverage carton designers and manufacturers can work together collaboratively to better understand how and where in the value chain these and other recyclability challenges can be most effectively tackled

Furthermore, the European Single Use Plastics Directive instructs Member States to prohibit products made from oxo-degradable plastic.

Design cartons to minimize unintended product residues

Product residues add weight when used cartons are collected and they are undesirable in the recycling processes. Cartons should be designed to simplify emptying and thus minimize residues remaining in the package after normal use.

Design cartons to be easily flattened

Flattened cartons take up less room in the consumer's recycling bin. Depending on the local situation, this can be important, as space is often a limitation in the home and in food service environments. Flattened cartons are normally more efficient in the collection system, but in some cases local market variations require that cartons should not be flattened as they need to be recognized as 3-dimensional objects in the sorting process. Nonetheless, new carton constructions and designs should ensure that they can be easily flattened by consumers where required.



At the point of consumption

Recyclability advantages of beverage cartons

Beverage cartons are easily recognizable for consumers. There is no need for them to differentiate between different constructions when recycling. Strategies vary country-by-country, but beverage cartons can be collected with other light-weight packaging, with other paper-based packaging or sometimes as a separate stream.

Actions to facilitate further recycling successes in the future

Inform consumers of how to recycle their used beverage cartons:

Consumer knowledge and behaviour play a major role in the success of recycling programmes. Communication and education are essential for ensuring that consumers know how to recycle their used beverage cartons. The sector can help all stakeholders by providing targeted communication materials.

Brand owners can include information on how to recycle within the graphic design of the package. This messaging can be in the form of printed text or other media on the package.

Before new digital communication technologies are applied, the compatibility of these with recycling processes should be investigated. Due to variations in systems between Member States, it is not possible to provide a single set of standard recycling information.

The messages need to align with the requirements of the market in which the beverage cartons are consumed. Local authorities and national recycling bodies also have a duty to inform consumers of how to recycle their packaging. However, it is always relevant to motivate consumers to add their emptied used beverage cartons to the appropriate packaging collection stream after use, as participation in packaging recycling allows them to make an essential contribution to environmental protection.

Collection

Recyclability advantages of beverage cartons

Cartons can be collected with other light-weight packaging or other paper-based packaging or sometimes as a separate packaging waste stream. Systems and infrastructure for collecting these material streams already exist in most Member States.

Collection in this way with these materials is compatible with existing sorting technologies. With

a few exceptions, it is not necessary to create new collection systems or infrastructure to increase the collection of beverage cartons ready for recycling.

Actions to facilitate further recycling successes in the future

Support and promote appropriate collection of beverage cartons separately from household waste:

Collection is a precondition to recycling. Collection



of packaging materials, separately from household waste, significantly increases the volume of materials available for recycling, which in turn creates a more predictable, high-quality waste stream as well as a strong incentive for investment and innovation within the sorting and recycling industry.

It is therefore essential that Member States ambitiously apply the requirements for the mandatory collection of packaging.

Promote collection of beverage cartons consumed out of the home:

On-the-go consumption is a market for beverage cartons. The HORECA (Hotels, Restaurants and Cafes) and HaFSA (Hospitality and Food Service) sectors and institutional users of beverage cartons and events represent an opportunity for additional collection that should be further pursued.

Sorting

Recyclability advantages of beverage cartons

Beverage cartons are easily sorted from other materials that they are collected with using existing automated optical sorting technologies that are widely installed at material sorting plants. The composition of beverage cartons provides unique spectral properties which allow their identification and automated separation at commercial speeds and with high yield and purity.

Actions to facilitate further recycling successes in the future

Ensure design changes are compatible with sorting technologies:

Any material or design changes should be investigated to ensure that the cartons remain compatible with sorting technologies or enable the introduction of new and improved sorting technologies.

Monitor developments in standards and sorting technologies:

Sorting practices and technologies are not static. It is essential that beverage carton manufacturers maintain a watching brief on new developments and ensure continued sortability of beverage cartons in the future or work together with members of the value chain to further improve sortability.

Support and promote appropriate collection and sorting infrastructure:

It is essential that Member States ambitiously apply the requirements for the mandatory collection of packaging. This provides a strong incentive for investment and innovation in sorting and recycling technologies, which creates



Recycling

Recyclability advantages of beverage cartons

Paper fibres from beverage cartons are highly desirable as a source of recovered fibre. After collection and sorting, the material is sent to paper recycling mills with dedicated equipment, where the beverage cartons are recycled in a process where water and agitation separate the paper fibres from the plastic and aluminium. There is already significant capacity for recycling of paper fibres from beverage cartons in Europe, with more than a dozen mills in operation today.

Collectively, these mills process significant volumes of used beverage cartons. Within the EU28, the recycling rate has grown steadily over recent years, with around 450,000 tonnes of material reprocessed in 2018. This represents a recycling rate of 49% of all cartons sold in Europe, with some countries such as Belgium and Germany achieving rates of over 70%¹.

Numerous projects are currently being in progress across Europe to achieve scale in the recycling of the polyethylene and aluminium fraction.

The plastics and the aluminium may be reprocessed together and it may also become possible to separate the aluminium from this stream. There are new technologies emerging to derive maximum value from the PolyAl fractions and several new reprocessing facilities will be commissioned. Outputs from these processes include secondary raw materials and agglomerated materials for manufacture of moulded products or compounding. A key objective of the industry's new pan-European recycling platform EXTR:ACT is to focus on scaling up the recycling of the PolyAl fraction and to monitor technologies that may contribute to this aim.

Actions to facilitate further recycling successes in the future

Promote the use of used beverage cartons at papermills through close co-operation:

A close cooperation between carton board suppliers, beverage carton manufacturers and stakeholders across the value chain will increase the efficient use of the fibres contained in beverage cartons. This includes working closely with recyclers to understand their needs whilst jointly exploring the recyclability implications of beverage cartons and determining how any recycling challenges can be efficiently managed so as to facilitate continued product innovation. Specific actions that could help to ensure that valuable fibres continue to reach recyclers include, but are not be limited to, promoting baling standards to maximise quality of input materials and promoting co-ordinated logistics to optimize collection and delivery efficiencies. Board suppliers and beverage carton manufacturers can also provide support to the value chain in efforts to address critical points and challenges for beverage carton recycling such as PolyAl valorisation, odour and insect control. Addressing these points will ensure that used beverage cartons continue to be an attractive and competitive source of fibre for recyclers compared to other alternative wastepaper grades.

Continue to scale-up PolyAl recycling solutions:

In order to maximize the benefit of recycling from both an environmental and an economic perspective, it is important that beverage carton manufacturers, for instance through the EXTR:ACT initiative, continue to help reprocessors to identify, adopt and scale-up solutions for extracting added value from the PolyAl fraction of the recycling stream.



Emerging issues

It is important for board producers and beverage carton manufacturers to keep a watching brief on emerging issues that may impact on the recyclability of beverage cartons or have an influence on recycling operations in the future. One such issue is the emergence of biodegradable polymers. Such materials have the potential to be incorporated into the construction of beverage carton designs, but this would affect the recyclability. Applications could include, for example, beverage carton caps, closures, straws and straw packaging.

The waste management and recycling industry generally has raised concerns regarding the effect the presence of biodegradable polymers has on the recycling of packaging. It is very important that,

should any biodegradable polymers be considered for use in carton construction and design, then the compatibility of these with the existing recycling processes should be ascertained to ensure that they do not negatively impact upon the performance of the subsequent materials and products manufactured from them.

Alternatively, consumers require clear information and instructions to ensure that they are aware of how to correctly sort and recycle any innovative beverage carton designs and constructions in line with local practices by recovery organisations and relevant regulations. New technologies such as marking could support transparent processing, providing benefits at the sorting and recycling steps.

Conclusions

Beverage cartons are a low carbon packaging solution, recycled where appropriate systems are in place that facilitate preparation of a separate beverage carton stream, either through separation by consumers prior to collection (which delivers the best quality material stream) or positive removal by sorting of the cartons from a mixed stream. They serve as a great source of once-used fibres for use in recycled paper products. This is evidenced in the current Europe-wide recycling rate of 49% in 2018 (based on the current recycling calculation method of accounting for the predominant material), with some Member States achieving significantly higher recycling rates than the average. The industry is committed to increase recycling of beverage cartons, and actions have been identified that beverage carton manufacturers and the wider industry sector can pursue through the platform provided by EXTR:ACT in order to enhance recyclability and drive higher collection and recycling rates for beverage cartons.

For individual board producers and beverage carton manufacturers:

- ✦ Follow the design for recycling recommendations listed in this document,
- ✦ Always ensure that material and design innovations are compatible with existing collection, sorting and reprocessing technologies,
- ✦ Evaluate, in co-operation with stakeholders along the value chain, any changes to the packaging and/or its composition with potential to affect the collection, sorting or recycling so as to facilitate adjustments which secure continued high quality recycling and protects the competitiveness of used beverage cartons as a fibre source compared to other waste paper grades,
- ✦ Actively monitor development and follow up on new technologies in the areas of waste collection, handling, sorting and reprocessing.

For the industry as a whole:

- Continue to support and promote appropriate and separate collection and encourage Member States to fully and ambitiously implement the requirements for separate collection of all packaging,
- ✦ Investigate other channels for collection of used



beverage cartons, such as the HORECA sector,

- ✦ Support the implementation and scale-up of solutions for the recycling of the PolyAl fraction,
- ✦ Take an active role in efforts to develop waste management solutions and technologies for all parts of the value chain
- ✦ Ensure that regulatory developments continue to facilitate optimized recycling solutions, which may include cross-border transfers of materials

between EU Member States and beyond

- ✦ Look for new, out of the box ideas that may deliver new collection, sorting or recycling opportunities
- ✦ Educate and communicate to consumers to ensure that beverage cartons are placed into the correct recycling stream.

Acting on these points will take the sector closer to achieve a higher recycling rate for used beverage cartons in Europe.

■ Glossary of terms

Biodegradation: a natural chemical process in which materials are being transformed into natural substances such as water, carbon and biomass with the help of microorganisms. The process of biodegradation depends on the environmental conditions as well as on the material or application itself. Consequently, the process and its outcome can vary considerably²

Oxo-degradable plastic: the underlying technology of oxo-degradability is based on special additives, which, if incorporated into standard resins, are purported to accelerate the fragmentation of the film products. Oxo-degradable materials do not meet accepted industry standards on compostability such as EN 13432³

Paper for recycling: the term paper and board for recycling is defined as “natural fibre-based paper and board suitable for recycling; consisting of paper and board in any shape or product made predominantly from paper and board, which may include other constituents that cannot be removed by dry sorting, such as coatings, laminates, spiral bindings, etc”⁴

PolyAl: comprises the non-fibre materials which are recovered following repulping and fibre recovery. PolyAl consists of polyethylene, aluminium and any other polymers used with the construction, including caps, lids and straws.

Recyclable: material which is capable of being reprocessed after its previous use to create a new material with a similar or different secondary use.

CEPI elaborates this further, “Recyclability of paper-based packaging: The individual suitability of a paper-based packaging for its factual reprocessing in the post-use phase into new paper and board; factual means that separate collection (where relevant and followed by sorting) into EN 643 grades and final recycling takes place on an industrial scale.”⁵

Repulable: means the paper undergoes re-wetting and fiberising for subsequent paper sheet formation⁶

Secondary packaging: Packaging additional to the primary packaging and that is used for protection and collation of individual units during storage, transport and distribution⁷

Secondary raw materials: recycled waste which can be injected to the economy as raw materials. These materials can be traded and shipped just like primary raw materials. Recovered paper for recycling at papermills is an example of a secondary raw material⁸

Tertiary packaging: Outer packaging, including pallets, slip sheets, stretch wrap, strapping any labels, used for the shipment and distribution of goods. This packaging is also referred to as transport or transit packaging and is rarely seen by the final consumer⁴

Thermoforming: the process of heating a thermoplastic material and shaping it in a mould



Acknowledgements

This document has been prepared by RISE Innventia on behalf of The Alliance for Beverage Cartons and the Environment (ACE).

RISE Innventia would like to thank the following organisations who have contributed their knowledge to this document:

- ♣ Alternapak
- ♣ BillerudKorsnas
- ♣ Elopak
- ♣ SIG Combibloc
- ♣ Stora Enso
- ♣ Tetra Pak

The team would also like to thank EXTR:ACT for providing input and clarifications on specific technical and market details.

Finally, we would like to thank the 8 stakeholders who have reviewed the final draft documents and provided useful comments:

- Fibre recyclers: PNM, SAICA
- PolyAL recyclers: Ecoplasteam, Recon Polymers, Palurec
- Waste management industry: Veolia
- Recyclability certification lab: Institute Cyclos HTP
- Paper industry association: CEPI

Notes

¹ Calculated using the method of accounting for the predominant material (2005/270/EC: Commission Decision of 22 March 2005 establishing the formats relating to the database system pursuant to Directive 94/62/EC of the European Parliament and of the Council on packaging and packaging waste). <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32005D0270>. From 2020, a new calculation method will come into effect which will require deduction of non-recycled materials and reporting of the recycling rate for each material separately

² <https://www.european-bioplastics.org/glossary/>

³ https://www.bpf.co.uk/topics/Standards_for_compostability.aspx

⁴ CEPI EN 643 European List of Standard Grades of Paper and Board. Guidance on the revised EN 643 2013 revision

⁵ Paper based packaging recyclability guidelines: How to specify and design paper-based packaging in a way to ensure high quality recycling by the paper industry; CEPI, CITPA, ACE and FEFCO, 2019

⁶ Voluntary Standard for repulping and recycling corrugated fiberboard treated to improve its performance in the presence of water and water vapour – Fibre Box Association and the American Forest & Paper Association. 2013

⁷ <http://www.wrap.org.uk/sites/files/wrap/Definitions.pdf>

⁸ https://ec.europa.eu/environment/green-growth/raw-materials/index_en.htm